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Argentina's Net Trade Development under an Exchange Rate Switch

A study on the impact exchange rate has on Argentina's trade balance

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Abstract

Argentina had a fixed exchange rate until January 2002 when the Argentinean banks allowed the peso to trade freely due to all the economic problems that the country underwent. This prompts us to find the impact of different macroeconomic variables on net export before and after an exchange rate regime change. The selected variables are Gross Domestic Product (GDP), interest rate, share price, inflation and exchange rate. An econometric model has been designed to predict this impact. The results showed that exchange rate regime change have a positive significant impact on the net export fluctuations. Our conclusion is that abandoning a direct peg relationship between an industrial country and a developing country does improve trade for the Argentina/USA case.

Key Words: Net Export, GDP, Exchange Rate, Inflation, Interest Rate & Share Price

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1. Introduction

This paper will discuss the economic development of Argentina from 1995 to 2007. Argentina was once one of the rising stars in the emerging market. During Argentina's Belle Époque from 1881 to 1914 the country had a GDP growth of 6% annually and it ranked among one of the top ten richest countries in the world. This economic prosperity abruptly changed to a recession as political and military coups interrupted the peace in Argentina. Argentina has faced two mayor crisis before 1995, the hyperinflation in 1989-1990 and the exchange rate regime change in 1991 which left the country a shadow of its former self (The Economist, 2014). How can one tell which of the 700 000 bullets that did the trick? Our focus will be the modern era of Argentina, when the country fully opened up for trade with goods, services and financial derivatives.

2. Purpose

The purpose of this paper is to see how different macroeconomic variables affect export and import before and after an exchange rate regime change. Argentina is an interesting country because it was once very prosperous but now it is considered less attractive because the country has faced many crises, several which have led to an exchange rate regime change.

3. History

Many researchers had taken turn to explain the downward economic development of Argentina, from a prosperous economy to the state the country is in today. Three aspects stood out to be considered the most crucial ones. One, Argentina was not modern and so couldn't adjust to external shocks, two, the role trade policies had and three the lack of an efficient institutional body that could generate the change Argentina needed when it needed it. This is illustrated by the fact that education wasn't considered important and only the elite class was well educated, which led to long run stagnation in technological development (The Economist, 2014).

Argentina had serious financial and economic difficulties in the 1980s and the economy went through a severe recession and hyperinflation. In an attempt to bring inflation down to acceptable levels and stimulate economic growth a series of drastic economic reforms were

introduced in 1991. On April 1st, the Convertibility Law was implemented. This law fixed the exchange rate of the Argentine peso at one peso per U.S. dollar. The Central Bank was hence converted into a form of Currency Board. Other economic reforms included tax reform, privatization of state owned enterprises, deregulation and liberalization of trade and financial flows (Wolf et al, 2008).

After the implementation of these reforms the economy prospered between 1991 and 1997 and the dollar peg helped bring inflation under control. The GDP grew rapidly besides a negative growth in 1995 due to the "Tequila" crisis in Mexico. The increased confidence in the predictability of the peso's future value encouraged foreign investment inflows (Caprio, 2012). Argentina, Paraguay, Brazil and Uruguay formed in 1991 a customs union called the Mercosur or "Common Market of the South". Mercosur's primary interest was to eliminate trade obstacles such as tariffs among members. A common external tariff was also imposed on goods imported from countries outside the union. The removal of tariff barriers led to an increase in trade between the Mercosur members.

Argentina had a constant balance account deficit during the countries expansion period that was covered by foreign borrowing. Huge speculation and low interest rate increased Argentina's debt burden through more borrowing.

In 1998 Russia's currency devaluated and the country couldn't pay its debt. The crisis in Russia made investors much more cautious about investing in emerging markets. Brazil, Argentina's main trading partner devaluated its currency in 1999. This had an impact on the Argentine economy leading to a rapid fall in exports as its goods became less competitive relative to Brazil's. In addition the dollar appreciated during the 1990s forcing the peso to appreciate and making the Argentine goods even less competitive. During this time the global economic slowdown also caused a decline in the agricultural products prices. The lower demand for exports and the foreign investor's loss of confidence in the Argentinean economy made the repayment of the foreign debt much more difficult since it had limited the country's ability to earn foreign currency.

During the year 2000 Argentine citizens were satisfied with the stability that the dollar parity provided but the risk premium continued to rise. By November 2000 IMF, Inter-American Development Bank, World Bank and the US and Spanish government constructed a support

package for Argentina the size of 39.7 billion dollar in order to decrease the risk from 1000 points to 600 points. This however didn't last as the risk premium rose again to 900 points during March 2001 (The Americas, 2010).

The weaknesses of Argentina's government control, trade policy and inefficient institutional structure became glaringly obvious when hyperinflation set in. During the 2001 Argentina's inflation was well over 70% and this was thought to have been caused by a series of external shocks. In 1998 Argentina's banks had been strengthened by the entry of foreign banks to the market. The second shock was the Brazil currency collapse in 1999 and although the crisis itself left Argentina relatively unaffected the government bond yield, the compensation investors demanded for holding them, was pushed up. Next there was the loss of confidence in the dollar peg and the insecurity in Argentina's ability to make good on the dollar liabilities caused by massive withdrawals of deposits (Moreno, 2002).

The country entered into a recession that lasted for 4 years. In 2001 there was an environment of uncertainty and people started to withdraw large sums of dollars from their bank accounts, changing pesos into dollars and causing a bank run. In an attempt to prevent capital outflow the government restricted bank deposits withdrawals for 12 months. The foreign debt had become unmanageable and in 2001 the country suspended payments on its external debt. Capital inflow decreased considerably and foreign investors fled the country.

Explanations that point to the occurrence of the crisis are Argentina's inability to reduce its public and external debt and the consequence that the country was made more vulnerable to economic shocks and shift in investor sentiment (Moreno, 2002).

In the end Argentina's fiscal surpluses defined as government revenue minus expenditure wasn't enough to cover the interest payment as their surplus was only 0.4% compared to the interest rate at 2.4%. Export growth was not enough to improve the country's ability to meet its debt payment. Argentina's rigid Currency Board arrangement caused an overvalued peso and the focus was so heavy on keeping the dollar peg that no attention was paid to real sector fundaments. To cut Argentina's debt government needed to decrease their spending, but it was reluctant to cut employment costs (Moreno, 2002).

On January 2002 the Argentinean banks allowed the peso to trade freely. Leaving the currency peg led to a huge devaluation of the domestic currency by 356%. The inflation and unemployment increased and by 2002 over 50% of the population was poor. All dollar denominated liabilities and deposits in the banking system were forcibly converted into pesos at unfavorable rates (Moreno, 2002).

The devaluation made export more competitive abroad and import uncompetitive. The high prices of import forced the people of Argentina to buy more domestically produced goods which stimulated the national industry. By 2002 GDP growth had returned and the economy began to recover. The exchange rate has stabilized.

In the thesis *Real Exchange Rate and Economic Growth* focus was put on tradable and non-tradable goods' development in developing countries. A direct relation between currency valuation and economic growth that depended on the growth of tradable goods and its reaction to government or market failure was illustrated in such a way that it could partially explain why emerging markets can't converge to a higher income level. Two critical weaknesses that prevents an emerging country from this are institutional weakness and product market failure. This argument is partially based on other researches that talks of the effect overvaluation has on growth. Overvaluation has an adverse effect on growth as overvaluation means a shortage of foreign currency, rent seeking, corruption, unsustainable current account deficit and balance payment crisis (Rodrick, 2008).

One of the researched countries, Mexico, showed a growth cycle induced by capital inflow and currency appreciation. The explanation given is that undervaluation has a positive impact on the share of tradable goods in the economy, especially for the industry in Latin America, while agricultural goods don't show a consistent outcome for neither undervaluation nor overvaluation. However the positive relationship between undervaluation and growth doesn't always hold as there are periods during which capital inflow has led to consumption led growth and currency appreciation. Thus an exogenous shock that depreciates the real exchange rate promotes growth (Rodrick, 2008).

4. Variable selection

Given the many theories mentioned above we have tried to quantify the investor sentiment, institutional inefficiency and foreign currency shortage so that it would be mathematically measurable in a time series regression.

The econometric model in this report is inspired by the regression used in the article *Selected Macro – Economic Variables and its Impact on Chinese and Indian Exports* (Tomar, Tomar, 2014). In this article they investigate the impact of different macroeconomic variables on the export of India and China. The parameters selected are Gross Domestic Product (GDP), foreign direct investment (FDI), exchange rate, GDP per capita and inflation. The formula looks as follow:

$$Exports = \beta_0 + \beta_1 GDP + \beta_2 FDI + \beta_3 exchange\ \ rate + \beta_4 GDP\ per\ capita + \beta_5 inflation \quad (4.1)$$

In the first part of the research the authors justify the selection of these variables. In the second part they run the regressions in order to find the variables that made significant impact on exports. Four different regressions were performed. The first two regressions study the impact of China's macroeconomic variables on the export of India respectively China. The following two regressions study the impact of India's macroeconomic variables on the export of India respectively China. The data used was annually measured.

The result shows that the most significant variable was GDP per capita which was positively related to exports. GDP and inflation were significant on two regressions. Exchange rate and FDI turn out to be significant in only one regression. It is not possible from the results to know whether the impact of these variables is either positive or negative. The R-squared values were above 0.9 which means that their models explain more than 90% of the variance in the exports.

In our thesis we will investigate the impact of different macroeconomic variables on the net export of Argentina. As it was not possible to find FDI monthly or quarterly values we have decided to replace this variable with share price. We believe that GDP and GDP per capita may be correlated. Therefore we have dropped GDP per capita even though it was found to

be the most significant variable (Tomar, Tomar, 2014). From previous research we have noticed that interest rate is an important indicator for investors and because we suppose that export and import depend on exchange rate that in turn depend on interest rate, we have decided to use this variable in our regression. To improve the analysis we have used monthly data since larger samples will produce more precise estimate of the regression coefficients (Wooldridge, 2012). The formula will be:

$$Net\ export_t = \beta_0 + \beta_{gdp} GDP_t + \beta_{sp} share\ price_t + \beta_{er} exchange\ rate_t + \beta_{ir} interest\ rate_t + \beta_{\inf} inflation_t + u_t \quad (4.2)$$

5. Variable description

The three main focuses in this paper are exchange rate regime change, economic crisis and trade. The above variables are used to determine the effect the crisis had on them and furthermore how they could have affected Argentina's trade.

Dependent variable

5.1 Net Export

The dependent variable in our regression is net export which represents the difference between exports and imports. If exports exceed imports then the country has a trade surplus. Conversely if the net export is negative, then the country has a trade deficit. From the International Monetary Fund (IMF) database we found monthly data for export and import for Argentina. We calculated the net export by taking the difference of the two. This was done in Excel before the data was imported to Stata, the econometric program we will use to analyze our data.

Independent variables

5.2 Exchange Rate

Exchange rate is defined as the value of one country's currency in terms of another country's currency (Baumol, Blinder, 2007). A weaker national currency makes exports cheaper to foreign buyers and import more expensive. Hence, devaluation stimulates exports and decreases imports. Conversely, a strong national currency makes imports cheaper and exports more expensive. The nominal exchange rate data was found monthly on IMF as National Currency per U.S. dollar, end of period rate.

Nominal exchange rate denotes the price of the domestic currency in terms of the foreign currency. An appreciation of the domestic currency imply that a foreign buyer would have to pay more foreign currency for the same domestic good. Countries that operate under a fixed exchange rate must keep the same ratio between their currencies for all future periods. The real exchange rate measure the price of domestic goods in terms of foreign goods by using the cost for both goods in each country directly. For example: If a car cost €50 000 and £43 000 then the ratio is 1.16. That means the car cost 16% more in €. In an open economy a buyer faces the choice between saving the money or buy in the domestic or foreign market. As many investors make different choices the current account reflects the net payments to and from the rest of the world. The choice between domestic and foreign assets depends on the interest parity condition which states that as long as interest rate and expected rated of depreciation are not to large ($\pm 20\%$) then exchange rate could be calculated as:

$$E_t = \frac{i_t^* E_{t+1}^e}{i_t - i_t^*} \tag{5.2.1}$$

This equation depends on the IS-LM relations in the domestic market (Blanchard et al, 2010).

5.3 Gross Domestic Product

GDP is the sum of the money values of all final goods and services produced during a specified period of time, usually one year (Baumol, Blinder, 2007). It can be measured as

$$GDP = consumption + investment + government\ spending + (exports - imports) \tag{5.3.1}$$

One can see from the formula that GDP is affected positively by exports and negatively by imports. However an increase in GDP does not necessarily imply an increase in net export since it can be caused by an increase in consumption, investment and/or government spending. The data was found on IMF. In our regression we use nominal GDP that is the GDP that has not been adjusted for inflation. It was not possible to find these values monthly so therefore we used the quadratic approximation to generate monthly data from the quarterly data (see Appendix).

5.4 Interest Rate

The wealth of a society is determined by the productivity capacity of its economy. The productivity of an economy can be divided into real and financial assets. Real assets such as land, building and knowledge provide goods and service, which generate a net income to the economy. Financial assets simply define the allocation of income among investors. Virtually all real assets involve some risk. Financial markets and various financial instrument allow investors with the greatest taste for risk to bear that risk while others can bear less risk. Investors invest for anticipated future returns. But those returns are always uncertain and deviate from the investors expected return (Bodie et al, 2011).

Interest rate and future return are one of the most important information an investor need as their decision is dependent upon the outlook of the interest rate. The fundamental factors that determine interest rates are supply of funds from savings, demand for funds from business and government net supply or demand for funds controlled by the Central Bank. Nominal interest rate is the growth rate of your money. Real interest rate is the growth rate for your purchasing power. For this paper we are using interest rate set at market rate found in the IMF database. This slight detour from the more usual use of nominal or real rate is because market rate includes risk-free cost of capital, inflationary expectations and cost of transactions which we think better reflects the impact of a crisis (Bodie et al, 2011).

Interest rate plays an important role in investment because each one is made with the intention of gaining a maximum payoff. Interest given by an asset determines its yield. Each investor faces a choice between investing in risk-free assets and in risky assets. The choice is restrained by what the market can offer and how risk averse the investor in question is.

Interest rate fluctuates over time which means there is an interest rate risk, as investors experience capital losses and gains. The risk is a measure of how correctly the price of an asset set today will equal its potential future value. Risk premium is defined as the expected return minus the risk-free rate. In other words the extra payoff an investor requires holding the risky assets instead of the risk-free assets. The risk-return-trade off simply illustrates that a higher expected return also means accepting a higher investment risk. If one can achieve a higher return without accepting further risk, then there will be rush to buy this higher return asset which will drive up its price. This asset will be considered attractive until its price has risen to a point that its expected return is the same as it’s commensurate with risk.

Above we have mentioned that investors in Argentina bonds demanded higher yield for holding them. This can be translated to the fact that they expect a higher risk in the future and this also means a higher risk premium. The support package with foreign reserve that Argentina received was a way to help the country keep its promise to the dollar peg. So that in the short run the risk premium will be kept down.

Globalization is defined as an increase of international trade and a decrease of barriers in the mobility of goods and service, in such a way that financial integration between the local and the global market is encouraged. This convergence means that systematic risk becomes more significant than before, as integration exposes the local market to more systematic risk (Knyght et al, 2011). Systematic risk is non-diversifiable risk brought on by the risk of facing financial crisis, economic meltdown, macroeconomic shocks and international shocks. This means that risk premium is set on the minimum level aligned with the systematic risk.

5.5 Share Price

The price of an asset is the sum of its value, its return and its risk. In our model we use share price as an indicator in order to study the Argentine trade. Share price is the present value of future cash flows for an asset. The price an investor is willing to pay for the right to claim those yields of a bond depends on what value the bond will hold in the future compared to the value in hand today. The present value depends on market interest rate. The market interest rate is complex because it holds the real risk-free rate of return and a premium to compensate expected inflation. In addition, bonds have a discount rate that reflects its characteristic risk, such as liquidity risk (speed with which it can turn into cash), tax attribute and call risk etc. Hence market sentiment will be captured by the share price (Bodie et al, 2011).

The share price was found in the IMF database compiled from the stock exchange in Buenos Aires, based on the Bolsa de Comercio de Buenos Aires. The Merval Index is based on the trading prices of BCBA weighted by trading volume (IMF, DSBB).

5.6 Inflation

Inflation is a sustained increase in the general price level of goods and services in an economy over time. High rates of inflation is often associated with overheated economies, where the demand for goods and services is outstripping productive capacity. This put pressure for a rise

in prices. Most governments in theory wish to maintain near full employment to stimulate the economy without bringing inflationary pressure (Bodie et al, 2011).

6. Statistical tests

The statistical tests that we will use on our data to get reliable results requires that we test for the different assumptions the Ordinary Least Square assumes for the method to be valid.

6.1 Unit Root

Unit root is associated with stationarity and weakly dependent. Data is a stationary time series process when the probability distribution for the time series remain unchanged when it is moved *h* periods ahead in time. One implication would be that X_t has the same distribution as X_1 for all *t=2,…,n* that is the sequence is identically distributed. The second assumption weakly dependent means that the X_t and X_{t+h} are almost independent as h increases. An intuitive understanding is that the correlation between X_t and X_{t+h} goes to zero as the data covariance is stationary over time. In other words the correlation between them becomes smaller and smaller as $h \to \infty$. Essentially the Law of large number and the Central Limit Theorem must both hold. A simple way to determine weakly dependence is to do a moving average process of order one. If weakly dependence exists then adjacent terms in the sequence are correlated. Another important point is that the sequence must be normally distributed with $(0, \sigma^2)$ and the error terms are also independent of *X*. This is the autoregressive process of order one.

Testing for unit root is simply:

$$X_t = \alpha + \rho X_{t-1} + u_t \text{ , and} \tag{6.1.1}$$

$$E\left(u_t \,\middle|\, X_{t-1}, X_{t-2}, \dots, X_0\right) = 0 \tag{6.1.2}$$

So unit root exist if the null hypothesis is true, that means the correlation coefficient $\rho = 1$.

$$H_0: \rho = 1 \tag{6.1.3}$$

$$H_1: \rho < 1 \tag{6.1.4}$$

The problem is that when unit root exist the asymptotic standard normal distribution doesn't apply even for larger samples (Wooldridge, 2012).

The *Dickey-Fuller test* for unit root is an ad hoc model that test for stationarity in the random walk. This test compares the null hypothesis to the alternative:

$$H_0: X_t = X_{t-1} + u_t, \text{ there is unit root} \quad (6.1.5)$$

$$H_1: X_t = c + \rho X_{t-1} + u_t \rightarrow X_t - \bar{X} = \rho(X_{t-1} - \bar{X}) + u_t \text{ , there is no unit root} \quad (6.1.6)$$

Most economic trends wonder and are not stationary thus differencing yields a stationary result. Data that follow random walk with white noise is said to have unit root (New York University, handout).

6.2 Multicollinearity

Correlation measures the strength of the relationship in the data (Siegel, 2011). A negative correlation indicates that one variable decreases as the other one increases. Alternatively, a positive correlation indicates that two or more variables move in the same direction. A strong correlation among the independent variables is called for multicollinearity. In this case some of the independent variables are too similar and essentially convey the same information. Hence it is complicated for the regression to compute the effect of each independent variable individually.

One way to check for multicollinearity is to look at the *correlation matrix* which is a table that gives the correlation between every pair of variables. The correlation coefficient ranges between -1 and +1. The higher the correlation coefficient (close to -1 or 1) between two independent variables the higher the multicollinearity. If the correlation coefficient is 0, then there is no correlation.

Multicollinearity misleadingly inflates the standard errors of the coefficients. Hence the confidence intervals for the coefficients tend to be very large and therefore the significance tests might give incorrect conclusions. Thus the coefficients for some independent variables may be found to be insignificant when they should be significant (Siegel, 2011).

6.3 Heteroskedasticity

Consider the following multiple linear regression model where the parameters are the β_j

$$y = \beta_0 + \beta_1 x_1 + ... + \beta_k x_k + u \tag{6.3.1}$$

Ordinary Least Squares (OLS) assume homoskedastic error terms. This implies that the variance of the unobserved error u is constant conditional on the explanatory variables

$$Var(u \mid x_1, x_2, ..., x_k) = \sigma^2 \tag{6.3.2}$$

If this is not true, that is the variance of u varies with the x variables then the error term is said to be heteroskedastic

$$Var(u \mid x_1, x_2, ..., x_k) \neq \sigma^2 \tag{6.3.3}$$

In the presence of heteroskedasticity the parameter estimates are still unbiased and consistent however OLS is no longer BLUE (Best Linear Unbiased Estimator). The OLS estimators no longer provide the estimate with the smallest variance so it is possible to obtain a better estimator than OLS. In addition, heteroskedasticity makes the standard errors no longer valid to construct confidence intervals and t-statistics (Wooldridge, 2012).

In order to use the t-statistics the standard errors must be adjusted for heteroskedasticity. OLS assumes that the error terms are independent and identically distributed random variables (i.i.d.). The robust standard errors which relax those assumptions can be used in the presence of heteroskedasticity.

6.4 Testing for Heteroskedasticity

To test whether or not heteroskedasticity is present one can use the *Breusch-Pagan test* or *White test* with the null hypothesis that the error variance is constant versus the alternative that the error variance is non-constant

$$H_0 : Var(u \mid x_1, x_2, ..., x_k) = \sigma^2 \tag{6.4.1}$$

$$H_1 : Var(u \mid x_1, x_2, ..., x_k) \neq \sigma^2 \tag{6.4.2}$$

Since the true population error terms are not observed, both tests use the OLS residual $\hat{u}$ as an estimate of the error u.

The Breusch-Pagan test regress the squared residuals $\hat{u}^2$ on the independent variables

$$\hat{u}^2 = \gamma_0 + \gamma_1 x_1 + \gamma_2 x_2 + ... + \gamma_k x_k + v \quad (6.4.3)$$

The White test regresses $\hat{u}^2$ on the independent variables, their squares and their cross products

$$\hat{u}^2 = \gamma_0 + \gamma_1 x_1 + ... + \gamma_k x_k + \gamma_{11} x_1^2 + ... + \gamma_{kk} x_k^2 + \gamma_{12} x_1 x_2 + ... + \gamma_{k-1,k} x_{k-1} x_k + v \quad (6.4.4)$$

If too much of the variance of $\hat{u}^2$ is explained by the independent variables then the null hypotheses is rejected and the regression suffers from heteroskedasticity. Conversely, if the independent variables do not explain much of the variation of $\hat{u}^2$ then there is no heteroskedasticity present (Wooldridge, 2012).

Heteroskedasticity in the Breusch-Pagan test means that the variance is linearly related to the independent variables. Heteroskedasticity in the White test implies that the variance of $\hat{u}^2$ is related to the independent variables in some way linear, quadratic or polynomial.

6.5 Autocorrelation

A time series that is autoregressive means that its future values are dependent upon a weighted sum of past values (Investopedia, 2014). A synonymous term is serial correlation, both means a violation of the Gauss-Markov assumption of uncorrelated random variables with normal distribution. If a time series has autoregressive nature then its coefficients no longer have minimum variance property, and the error terms are greatly underestimated, thus making the standard deviation, t-statistic and F-statistic no longer applicable (Cortinhas, Black, 2012).

The first order autoregression (AR(1)) is:

$$u_t = \rho u_{t-1} + v_t \tag{6.5.1}$$

Where ρ measures the correlation between the error terms and has a value between -1 and 1. *Durbin-Watsons test* can determine the presence of serial correlation using the following equation:

$$D = \frac{\sum_{t=2}^{n}(u_t - u_{t-1})^2}{\sum_{t=1}^{n} u_t^2} \tag{6.5.2}$$

This two tailed test uses the null hypothesis which claims no autocorrelation and the alternative hypothesis that states that there is autocorrelation. In this case, we don't want to reject the null hypothesis (Cortinhas, Black, 2012).

$$H_o: \rho = 0 \tag{6.5.3}$$

$$H_1: \rho > 0 \tag{6.5.4}$$

The result is determined against a d_U value and a d_L value in the way that if D is larger than d_U we fail to reject the null hypothesis, if D is below d_L we conclude that there is autocorrelation. However should D end in-between d_L and d_U then the test is inconclusive (Cortinhas, Black, 2012).

An autoregression model looks as follows:

$$\hat{X} = b_0 + b_1 X_{t-1} + b_2 X_{t-2} + b_3 X_{t-3} \tag{6.5.5}$$

A slightly different test is the *Breusch-Godfrey test* that test for serial correlation of higher order. The Breusch-Godfrey test allow for any number of lags. This test for joint significance of all the residual values lagging all the way back to q lags. This test also requires homoskedasticity on the data to be valid (Wooldridge, 2012).

The Breusch-Godfrey regression is:

$$\hat{u}_t = \alpha_0 + \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \rho_1 \hat{u}_{t-1} + \rho_2 \hat{u}_{t-2} + \cdots + \rho_p \hat{u}_{t-p} + v_t \qquad (6.5.6)$$

6.6 Newey-West

Newey-West is a heteroskedastic and autocorrelation-consistent regression standard error model that accounts for lagged dependence. The Newey-West standard errors must be calculated conditional to the maximum number of lags the model must have. The number of lags this test requires is given by $lags = 0.75 * T^{1/3}$ where T is the number of observations used in the regression (Simon, 2013).

The estimated coefficients using the Newey-West methodology are identical to those produced by OLS regression. The Newey-West standard errors can be used in the presence of autocorrelation and/or heteroskedasticity (Wood, 2009).

7. Method

In this thesis we want to study whether the values of the independent variables have changed significantly after the Currency Board was abandoned. We have therefore divided our data into two periods. The before crisis period comprises the years 1995-2001. The after crisis period starts at January 2002, when Argentina let the currency float, and end at 2007. We will also analyse a third time period 1995-2007.

In order to do a regression and test the impact of GDP, share price, interest rate, inflation and exchange rate on net export we downloaded data from the International Moneraty Fund (IMF) data base. Some of the data needed to be converted (see Appendix). Net export, our dependent variable was calculated as the difference between export and import.

We checked our data and found only one missing value. If this would cause any problem in our regression we will remove the whole row that is we will remove all variable values for that specific month.

For each time period we will run a regression. The regressions will be tested for stationarity, multicollinearity, heteroskedasticity and autocorrelation in order to get reliable results.

Stationarity will be tested using the Dickey-Fuller test. If a variable turns out to be non-stationary it will be replaced with that variable's first difference.

We will check for multicollinearity using the matrix correlation. Correlation coefficients whose absolute values are less or equal to 0.35 are considered lowly correlated, 0.36 to 0.67 modestly correlated and 0.68 to 1 highly correlated (Taylor, 1990). If two independent variables are highly correlated, we will remove from the regression the less significant variable between those two.

Two different tests will be used when controlling for heteroskedasticity, namely the Breusch-Pagan test and the White test. As both test are for different kinds of heteroskedasticity, we will correct for this if one of the tests reject the null hypothesis.

Autocorrelation of first order will be tested with the Durbin-Watson test. To check for serial correlation beyond the first order the Breusch-Godfrey test will be performed. For the Breusch-Godfrey test we will use 12 lags which in our case represent 12 months. We choose 12 since we believe that the value for a specific month may be correlated with the value from the previous year (12 months ago).

In the presence of heteroskedasticity and/or autocorrelation we will use the Newey-West standard errors which are heteroskedasticity and autocorrelation consistent estimates of the standard error (Wooldridge, 2012). When running the regression with the Newey-West standard errors we will use the number of lags given by the rule of thumb, $lags = 0.75 * T^{1/3}$ rounded to an integer, where T is the number of observations used in the regression (Simons, 2013).

After performing the different tests and using the Newey-West standard errors we will be able to see which variables have a significant impact on net export and whether this impact is positive or negative. The size of the impact will however be difficult to interpret as described in section 9.

An extra regression will be implemented in the whole time period 1995-2007. In this regression we will replace the variable exchange rate with a dummy variable. The dummy

variable is equal to 1 when the exchange rate is floating and 0 when the exchange rate is fixed. The estimated coefficient for the dummy can be interpreted as the influence floating exchange rate has on net export compared to the influence of the fixed exchange rate.

8. Hypothesis

After the first hyperinflation period Argentina has rigidly committed itself to the Convertibility Law and most of its policies point towards encouraging an inflow of foreign investment. Therefore with the rigid control on exchange rate other macroeconomic variables might have been neglected in order to keep the Convertibility Law. We wish to test whether this have a significant impact on how the other macroeconomic variables performed during 1995-2007. We choose to include the crisis at 2001 because many previous work point towards the Currency Board being inefficient and that the Convertibility eventually became unsustainable. Furthermore Argentina's public debt size and institutional structure have been criticized. Our hypothesis is that abandoning the Currency Board affected their net export growth positively:

$$H_0: a\ change\ in\ exchange\ rate\ regime\ has\ had\ no\ impact\ on\ net\ export \quad (8.1)$$

$$H_1: a\ change\ in\ exchange\ rate\ regime\ has\ had\ impact\ on\ net\ export \quad (8.2)$$

We do a two tailed test even though it could have been one tailed. The reason is that the two tailed test could show whether the effect if there is any, is positive or negative and the significance requirement are more strict, making our model more valid if true.

9. Restraints

Above we have introduced a series of statistical test and their characteristics. Here a few words need to be said about their limitations which will restrict the discussion and conclusions drawn from our results.

The OLS model that we have use sets the relation between the independent and dependent variables to a linear equation, hence the many assumptions that the models makes. That doesn't mean that a true non-linear relation doesn't exist between the two variables. Because the model only uses a linear fit there is a high risk that our model doesn't show the true relationship between the independent and dependent variables. The Breusch-Pagan and White

test for heteroskedasticity are both in a generalized forms. Neither of the tests actually tells what the cause for heteroskedasticity is. White test is even more general as it tests for all types of relationship between the residuals and independent variables. If we reject the White test we know that the relation is complex but we do not know if it's a cross product, polynomial or other kind of relation. Autocorrelation makes the model not the Best estimation for the relationship between the variables. The most serious problem that can cause autoregression is a measurement error which makes the model no longer unbiased. The time lag that occurs complicates the impact a variable has on our dependent variable (Wooldridge, 2012).

Also for our model we don't test the residuals on our independent variables to see if there is a problem for omitted variables as it is beyond the scope for the purpose of our thesis. To get closer to a true model we would have to test independent variables using higher order. But as our intention is simply to see if an exchange rate regime change affects trade it is beyond the scope for this paper to specify exactly how this relationship looks like.

Recently there has been an increased use for the Dynamic Stochastic General Equilibrium (DSGE) which uses a combination of the New-Keynesian and Neoclassical economic models to forecast interest rate, expectations etc. This model allow for many more sophisticated calculations of the non-linear kind to test the impact for various macroeconomic factors on a dependent variable. This model is very difficult and truly beyond the ability of the two of us, but it would yield much better results (Negro, Schorfheide, 2012).

It is difficult to interpret the size of the impact our independent variables have on the dependent variable because we use real numbers instead of logarithmic variables. Because of this we will focus instead on whether the impact is positive or negative. To understand this better we look at the following formula:

$$y = \beta_0 + \beta_1 x + u \tag{9.1}$$

If we change x by 1, we will expect y to change by β_1. In order to know whether the effect is small or big we have to look at the values of the data. For example an increase of y by 1 is big if the y value is 2 but small if the y value is 10000. If one wants to interpret the size of the impact without looking at the data values one can use the following formula:

$$\ln(y) = \beta_0 + \beta_1 \ln(x) + u \tag{9.2}$$

A change in *x* by 1% will give an expected change in *y* by β_1%. In this case the dependent variable can only have positive values. Since net export has both positive and negative values we cannot use this formula in our model.

Also we don't test for type I or type II errors as it is impossible for us to know when we reject the null when it is true or if we accept the null when it is untrue. This is because we have no life experience of previous research in this area and many studies give contradictory results.

10. Results

10.1 Before Crisis (1995-2001)

We began by looking at a summary of all data to see the means, medians, minimum value, maximum value, skewness and kurtosis of each variable. After that we did a regression on net export with interest rate, share price, GDP, inflation and exchange rate as the independent variables. The first regression had an F-value of 2.28 and a p-value at 0.07 so it was significant at the 10% level. The R-squared value is 10.5%. The data might be unreliable due the many assumption requirements OLS assumes for the data to be valid as we have discussed above. We began by doing a stationarity test on each variable using the Dickey-Fuller test for unit root and found that share price and exchange rate have unit root. As above mentioned unit root implies non-stationarity and we need to correct the data using first difference. Share price became stationary after the first difference but for exchange rate unit root was still present after the second difference. However we decided to keep exchange rate in our model anyway. Throughout the whole report we will add a diff prefix to our variable if we take the first difference.

The second regression using the new variables gave a p-value of 0.84, which made the model very insignificant and all our independent variables were insignificant as well. The R-squared value is 1.8%. Next we tested for multicollinearity using correlation matrix and found that all the correlation between our variables are below 0.16 and above -0.28 which is within our acceptance level at ± 0.68, that data is not multicollinear. The Breusch-Pagan and White test

for heteroskedasticity gave a p-value of 0.57 and 0.27 respectively, which suggest that we can accept homoskedasticity on a linear, quadratic and multiple level. The Durbin-Watson autocorrelation test yielded a value at 1.18. Comparing to $d_U = 1.75$ and $d_L = 1.55$ we are below the d_L value, which means we reject the null hypothesis and accept the presence of autocorrelation in our model. Since Durbin-Watson only tests for AR(1) we use the Breusch-Godfrey to test for serial correlation on higher level. With 12 lags the Breusch-Godfrey p-value is 0.00 which means autocorrelation exist at 12 lags. In order to take autocorrelation into account we changed our ordinary regression to the Newey-West regression. Writing the equation with the coefficients from Newey-West regression we get the following formula:

$$Net\ export_t = 44.76 - 0.02GDP_t + 0.29diff.share\ price_t \qquad (10.1.1)$$
$$-0.04interest\ rate_t + 0.01inflation_t + u_t$$

1995-2001	Coefficients	F-value	t-value	p-value	Chi2	Durbin
Breusch-Pagan				0.57	0.32	
White test				0.27	16.76	
Durbin-Watson	81, 5 (obs,df*)					1.18
Breusch-Godfrey				0.00	29.56	
Newey-West	81, 4 (obs, df*)	0.60		0.66		
GDP	-0.02		-0.14	0.89		
Diff. share price	0.29		1.42	0.16		
Diff. exchange rate	omitted					
Interest rate	-0.04		-0.33	0.75		
Inflation	0.01		0.13	0.90		
Constant	44.76		4.19	0.00		

Table: 10.1 Newey-West regression result and statistical test, presence of autocorrelation but not heteroskedasticity

*= observation, degree of freedom

Newey-West regression with 3 lags requirement gave an F-value at 0.60. Comparing this p-value at 0.66 with the p-value of the first regression after controlling for stationarity at 0.84, the model has improved but it's far from significant. The only variable that is close to being significant is the share price that has a p-value of 0.16. Exchange rate was omitted in all regressions due to collinearity. The Newey-West test doesn't give an R-square value.

10.2 After Crisis (2002-2007)

Following the same steps for this period the first regression on net export yielded an F-value of 1.89 and it was significant on the 10% level. Out of our five independent variables only

interest rate, inflation and exchange rate became significant on the 10% level. The Dickey-Fuller test showed that GDP and exchange rate had unit root, which was corrected using first difference. The second regression turned out much better with an F- value of 2.70, a p-value of 0.03 and an R-squared value of 17.2%. That means our model is significant on the 5% level, however only inflation and exchange rate were significant in this test. Interest rate had a p-value of 0.25 that made it insignificant compared to the first regression done. Continuing to test for multicollinearity, the correlation matrix showed much higher values than for the before crisis period. Now the correlation are between -0.57 and 0.18. The $Corr_{interest\ rate,share\ price}$ has become 14 times larger, $Corr_{share\ price,inflation}$ has become 3 times larger. $Corr_{GDP,interest\ rate}$ however is almost unchanged, as it has become only slightly smaller. We accept low to modest correlation between the independent variables in our model since we draws the line at ± 0.68 (Taylor, 1990). The Breusch-Pagan test accepted homoskedasticity same with the White test, although the p-value is 0.12 which is close to the 10% significance. Durbin-Watson's autocorrelation test gave 2.06, that is higher than the $d_U = 1.77$ and $d_L = 1.46$, so we accepted no serial correlation. Breusch-Godfrey that test for higher level of AR, gave a p-value of 0.21 and so we accept no serial correlation.

It is not necessary to run the Newey-West regression because we accept both no heteroskedasticity and no serial correlation, but we still want to see if the p-values changes for our independent variables. The third regression's F-value is 4.35 and is significant at the 1% level. Also inflation and exchange rate are significant on the 1% level. However share price, interest rate and GDP are insignificant. This might be a sign of non-linearity between net export and these three variables as our model is not enough to give significance. The equation for the after crisis period would be:

$$Net\ export_t = 55.74 - 0.11diff.GDP_t - 0.06share\ price_t + 1.43diff.exchange\ rate_t$$
$$-0.18interest\ rate_t - 0.31inflation_t + u_t \qquad (10.2.1)$$

2002-2007	Coefficients	F-value	t-value	p-value	Chi2	Durbin
Breusch-Pagan				0.78	0.08	
White test				0.12	27.50	
Durbin-Watson	(71, 6) (obs, df*)					2.06
Breusch-Godfrey				0.21	15.65	
Newey-West		4.35		0.01		
Diff. GDP	-0.11		-0.80	0.42		
Share price	-0.06		-0.52	0.60		
Diff. exchange rate	1.43		3.18	0.00		
Interest rate	-0.18		-1.43	0.16		
Inflation	-0.31		-2.94	0.01		
Constant	55.74		7.05	0.00		

Table 10.2 Newey West regression and statistical tests, neither autocorrelation nor heteroskedasticity

*= observations, degree of freedom

The most noticeable difference is the exchange rate variable that was omitted in the before crisis period, here have a positive effect on net export. That is if diff.exchange rate increased by 1 dollar then net export will increase by 1.43 dollar. Also the sign for inflation was positive for the before crisis period but its negative for the after crisis period, same is true for share price. The effect of GDP has become five times larger in absolute values.

10.3 Regression for the Whole Period (1995-2007)

In order to get reliable results we want the variables to be stationary. Stationarity was checked using the Dickey-Fuller test. All variables except for exchange rate rejected the null hypothesis of non-stationarity at the 2% significance level. Exchange rate failed to reject it as its p-value was 0.59. The exchange rate variable was therefore replaced with its first difference denoted as diff.exchange rate. The Dickey-Fuller test showed that this new variable is stationary.

When testing for multicollinearity we looked at the correlation matrix between the independent variables to remove those that have a high correlation, using the limit we set at ± 0.68 for high correlation (Taylor, 1990). In our model all the coefficients were lower than 0.33 indicating a strong absence of multicollinearity. We ran the regression again and this time interest rate and share price were significant at 1% level. All the other variables were insignificant. The R-squared showed that 13.42% of the variation in net export was accounted for by the independent variables and the F-value is 4.59.

The regression was tested for both heteroskedasticity and autocorrelation. Our regression do not suffers from heteroskedasticity since both the Breusch-Pagan test and White test accepts homoskedasticity. When checking for autocorrelation the Breusch-Godfrey test rejects the null hypothesis of no serial correlation at the 6% level and the Durbin- Watson test rejects it at the 5% level.

The Newey-West standard errors were implemented to fix the regression for autocorrelation. The number of lags was given by the rule of thumb (Simons, 2013). With 155 observations this number was calculated to be 4. We ran the regression with the robust standard errors and got the following formula:

$$\begin{aligned} Net\ export_t = {} & 131.30 - 0.29 interest\ rate_t + 1.30 diff.exchange\ rate_t - 0.11 inflation_t \\ & - 0.27 share\ price_t - 0.03 GDP_t + u_t \end{aligned} \qquad (10.3.1)$$

1995-2007 no dummy	Coefficients	F-value	t-value	p-value	Chi2	Durbin
Breusch-Pagan				0.51	0.43	
White test				0.38	21.32	
Durbin-Watson	(154, 6) (obs, df*)					1.45
Breusch-Godfrey				0.06	20.25	
Newey-West						
Net export		3.82		0.00		
GDP	-0.03		-0.30	0.76		
Share price	-0.27		-2.80	0.01		
Diff. exchange rate	1.30		1.47	0.15		
Interest rate	-0.29		-2.77	0.01		
Inflation	-0.11		-1.47	0.15		
Constant	131.30		8.68	0.00		

Table 10.3 Newey-West regression with statistical tests, presence of autocorrelation but no heteroskedasticity

*= observations, degree of freedom

Interest rate and share price were significant at 1% level. Both variables had a negative impact on net export. All the other variables were insignificant. It is important to notice that diff.exchange rate and inflation are not that insignificant since their p-values are 0.15. In this regression GDP is the least significant variable with a p-value of 0.76 indicating that there is a 76% probability that the actual value of the coefficient could be zero.

In order to see how the exchange rate regime affects the net export we decided to replace the exchange rate variable with the dummy variable denoted as floating exchange rate. The dummy variable is equal to 1 when the exchange rate is floating and 0 when the exchange rate is fixed. This variable was not tested for stationarity since its interpretation is different compared to the other independent variables. The matrix correlation showed that the correlation coefficients were smaller than 0.64 implying that there is no multicollinearity. We ran the regression and got that the dummy variable is significant with a p-value of 0.01. Share price and interest rate are also significant, with a p-value equal to 0.01 respectively 0.03. GDP and inflation are insignificant. The R-squared value was 16.5%.

The Breusch-Pagan test accepts the null hypothesis of homoskedasticity whereas the White test reject it at the 0.07% level. Since the two tests gives us different results we will follow the one that rejects the null hypothesis of homoskedasticity.

When checking for autocorrelation the Breusch-Godfrey test accepts the null hypothesis of no serial correlation whereas the Durbin-Watson rejects it at the 5% level. Therefore autocorrelation of order one is present. We used the Newey-West standard errors with 4 lags and got the following formula:

$$Net\ export_t = 91.65 - 0.21 interest\ rate_t + 27.21 floating\ exchange\ rate_t - 0.06 inflation_t - 0.22 share\ price_t + 0.14 GDP_t + u_t \quad (10.3.2)$$

1995-2007 with dummy	Coefficients	F-value	t-value	p-value	Chi2	Durbin
Breusch-Pagan				0.14	2.13	
White test				0.00	45.15	
Durbin-Watson	(155, 6) (obs, df)					1.52
Breusch-Godfrey				0.20	15.80	
Newey-West						
Net export		7.61		0.00		
GDP	0.14		1.47	0.14		
Share price	-0.22		-2.22	0.03		
Dummy (floating exchange rate)	27.21		2.46	0.02		
Interest rate	-0.21		-1.99	0.05		
Inflation	-0.06		-0.80	0.42		
Constant	91.65		3.73	0.00		

Table 10.4 Newey-West regression with statistical tests, presence of heteroskedasticity and autocorrelation

*= observations, degree of freedom

The dummy variable shows that the floating exchange rate had a positive impact on net export and it is significant with a p-value equal to 0.02. Share price and interest rate are also significant, with a p-value equal to 0.03 respectively 0.05. GDP and inflation are insignificant. It is important to notice that GDP is not that insignificant since its p-value is 0.14.

11. Discussion

Below for our discussion we define Argentina as the domestic country when we discuss economic theory. A foreign country would be any potential country Argentina is trading with, like the Mercosur customs union.

11.1 Gross Domestic Product

GDP turn out to be insignificant on the three different time periods that we analysed. We conclude therefore that it has no impact on net export given this model.

By looking at the formula for GDP (5.3.1), one can see that GDP is affected negatively by import and positively by exports. From this one can deduce that net export have a positive impact on GDP if export is larger than import. However the opposite does not necessarily need to be true.

A higher GDP leads to higher incomes and some of this money is spent on domestic as well as on foreign goods and services. This means that if a country's GDP increases given ceteris paribus, it will lead to an increase in imports. Conversely a fall in GDP will lead to a fall in imports. Similarly a countries export, which is the import for other countries, will depend on the other country's GDP (Baumol, Blinder, 2007). An increase in GDP will cause a rise in import and therefore a fall in net export.

To compare theory with previous empirical research we studied a report on United States and Canada. We found that the causality effects between GDP, export and import is not always clear. The study show that export and import jointly has an impact on GDP. However this result isn't conclusive because GDP and export can cause import as well. Therefore since the size of export and import were almost the same in the before crisis period for Argentina, it is unlikely that the causality effect showed by the study will be true for Argentina. In the graph

H2 we see that net export was close to zero for the before crisis period and it was only after 2006 that it really started to take off. Hence the effect isn't large enough to significantly be related to the exchange rate regime change. More likely, net trade increased after the peso devalued by 356% which made Argentina's goods more competitive (Zestos and Tao, 2002). That the effect came quiet late show that there is a time lag before the effect of the floating exchange rate became pronounced. For Canada an increase in export gave the country more foreign currency to pay for imports. Argentina's GDP increased soon after 2002, but not because of net export as it only took off after 2006. We believe GDP increased because people were forced to buy more domestic goods since import was too expensive because of the depreciated peso. So there might have been a time lag before net export could benefit from the floating exchange rate (see 5.3.1) (Zestos, Tao, 2002).

11.2 Exchange Rate

Exchange rate was omitted in the before crisis period due to collinearity. During this time period the exchange rate was fixed at 1 peso per U.S. dollar.

During the after crisis period the Currency Board was abandoned and the Argentinean banks allowed the peso to trade freely. Leaving the currency peg led to a huge devaluation of the national currency. During the first 12 months the exchange rate reached values of 3.5 pesos per dollar to then stabilize around 3 pesos per dollar. A weaker national currency makes exports cheaper to foreign buyers and import more expensive since currency depreciations and appreciations changes the international relative prices. Hence, devaluation stimulates exports and decreases imports. According to this we believed that the floating exchange rate had a positive impact on net export. Since the exchange rate variable was non-stationary we used its first difference. The results of our model showed that this variable had a positive and significant impact on net export as we had expected.

In the first regression done for the whole period we didn't use a dummy variable so this time period will not give us the impact of the fixed respectively floating exchange rate on net exports. The results will show instead the total impact of both exchange rate regimes on net export, which in this case was insignificant.

Since we did not get any results in the before crisis period regarding the fixed exchange rate we ran a second regression on the whole time period with a dummy variable. The dummy

variable is equal to 1 when the exchange rate is floating and 0 when the exchange rate is fixed. In this way one can see the effects of leaving the Currency Board on net export. The results showed that the floating exchange rate had a positive and significant impact on net export compared to the fixed exchange rate. This means that leaving the Currency Board stimulated the net export.

11.3 Inflation

The impact of inflation on net export when the exchange rate was fixed is positive for our before crisis model, but insignificant. For the after crisis period inflation became very significant however its effect on net export was negative. When we tested inflation for the whole time period it impacted negatively on net export but insignificantly. We believe this is true for our model because when the exchange rate was fixed, in the short run there should be no expectation for higher future inflation, given that the interest rate parity holds. That is the price for domestic goods is the same as the price for the same good in foreign currency. The time period 1995 to 2001 is considered a short run to medium run during which time, the inflation spiked twice during 1996 and 2000 but otherwise it remained quite stable at $\pm 2\%$. For the after crisis period after the initial spike of inflation at 5.5% the inflation centered itself around 0% (see graph H1).

An inflation around zero during a floating exchange rate regime would be significant if we look back at the theory between inflation and employment. The aggregated supply for the economy relied on price, expected price and unemployment level, in such a way that the higher the unemployment level the lower the wage. Thus an expected inflation would lead to actual inflation which would increase actual price. As price increases during one period there would be an expectation for price increase for the next (Blanchard et al, 2010).

For the after crisis period inflation was almost zero and therefore without the expectation of a price increase foreign countries would buy more of the domestic goods. Hence changes in net export would depend significantly to the changes in inflation. Without inflation expectation wages would remain stable and so would prices in the domestic country. The significance for this variable was 1%, very high.

However across the whole period (1995-2007) inflation is insignificant. In the long run the inflation changes reflect "one for one" the changes in the nominal interest rate, therefore there is no need to distinguish between real or nominal interest rate when inflation is zero (Blanchard et al 2010). This is why we believe inflation was insignificant in the regression for the whole period, as the fixed exchange rate meant that inflation would follow that of the US and during the floating exchange rate period it was close to zero most of the time.

11.4 Market Interest Rate

Market interest rate was insignificant when tested for the two shorter periods separately but it became significant for the whole period 1995-2007. Market interest rate incorporates alternative consumption or alternative investment elements of interest. It balances the money, bond, stock and currency market rates, because this rate is determined by demand and supply in all those markets (Business dictionary, 2014).

When the confidence in the Argentina government decreased as the country couldn't pay its public debt the risk for default increased and so did the interest rate. For the first period 1995-2001 the interest rate was a little below 10% until 2000 when it began to rise. During 2001 interest rate rose dramatically in three intervals up to 90% (see graph H5). The regression for the separate periods showed interest rate to be insignificant but we believe it still explain much of the net export development.

The regression was cut right at the crisis and so the econometric model might have treated the spike in interest rate as an outlier. Once corrected for autocorrelation the effect of the time lag that crisis usually cause was removed and so interest rate became insignificant. However market interest rate became significant for the whole period regression. The volatile movements of the interest rate show the environment of uncertainty and the restriction of bank deposit withdrawals during 2001. Also it clearly shows the point when investors fled the country.

Going back to the school white board, we recall that interest parity condition tells that domestic interest rate must equal the foreign interest rate minus the expected appreciation rate of the domestic currency. In 2001 there was an enormous uncertainty whether Argentina could keep the dollar peg or if they would change to a floating exchange rate that therefore increased the risk premium. The interest rate that would give this extra required premium is

shown by the market rate. As most investors are not risk lovers they would not invest in such a volatile market (Blanchard et al, 2010; Bodie et al, 2012).

11.5 Share Price

Share price was also insignificant when tested for the two shorter periods and it was significant when tested for the entire period. It would significantly affect net export negatively.

However it is still interesting to discuss the different impact share price has on a fixed and a floating exchange rate regime. In the Philips curve model a distinction is made between natural rates of the economy and real rates of the factors in the economy. If real interest rate is below natural interest rate then inflation increases. When inflation growths to become larger than nominal money growth, the real money growth would be negative. In turn both nominal and real interest rate will increase. The imbalance in the money market caused by lending, caused a rise in share price, when the Central Bank no longer have enough foreign currency to back up the dollar peg (Blanchard et al, 2010).

Share price during fixed exchange rate had a mean value of 34 dollar whilst its mean value for the after crisis period is 85 dollars. As investors fled the country the demand for Argentina bonds decreased which lowered its price. When the dollar peg was abandoned there was a huge devaluation of the peso at 356%, which means that the Argentina bonds were practically sold for free. This means that investors could claim future yield for almost no money at all today. This huge arbitrage opportunity was readily exploited when investors suddenly rushed to buy the Argentina bonds and drove share price up from 20 dollar to 140 dollar. Given the almost nonexistent inflation it means that the peso will keep its value in future and there would be no expected devaluation risk.

12. Conclusion

Our conclusion is that exchange rate have a positive significant impact on the net export fluctuations. Our hypothesis that abandoning a direct peg relationship between an industrial country and a developing country improve trade is true in the Argentina/USA case. Both share price and interest rate show investor's sentiment towards Argentina. A direct peg renders inflation insignificant as a factor in net export for Argentina. The impact GDP has on net export is still unclear. When exchange rate was transformed into a dummy variable, the coefficient showed that the change from fixed to floating exchange rate had a large impact on Argentina's trade balance.

The R-square for our different models is no larger than 20% which means that 20% of the variation in net export is accounted by the independent variables. This means further research is needed to better explain the crisis that Argentina experienced. Maybe there are other variables whom were omitted in this model that could better explain the trade balance development during this period.

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14. Appendix

14.1 Appendix A
Transformation of quarterly GDP to monthly GDP

It was not possible to find the GDP values monthly so therefore we used the quadratic approximation to generate monthly data from the quarterly series (Sjöö, 1990). In order to do that we assumed that the time series followed a quadratic function, like $at^2 + bt + c$. The quarterly value denoted by q_{X_t} is equal to an area measured by an integral between the time t and $t+1$,

$$q_{X_t} = \int_{t}^{t+1} (at^2 + bt + c)dt \qquad \text{(A.1)}$$

The sum of the three monthly observations within the quarter must equal q_X. For $t=1$ we get therefore,

$$q_{X_1} = m1_{X_1} + m2_{X_1} + m3_{X_1} \quad \text{(A.2)}$$

$$q_{X_1} = \int_1^{\frac{4}{3}} (at^2 + bt + c)dt + \int_{\frac{4}{3}}^{\frac{5}{3}} (at^2 + bt + c)dt + \int_{\frac{5}{3}}^{2} (at^2 + bt + c)dt \quad \text{(A.3)}$$

The values of a, b, c are constant and these are needed to find the monthly values within a quarter. One can write three successive quarterly observations as,

$$q_{X_{t-1}} = \int_0^1 (at^2 + bt + c)dt \quad \text{(A.4)}$$

$$q_{X_t} = \int_1^2 (at^2 + bt + c)dt \quad \text{(A.5)}$$

$$q_{X_{t+1}} = \int_2^3 (at^2 + bt + c)dt \quad \text{(A.6)}$$

These formulas are used to make up a system of three unknowns and three equations in order to find the constant values a, b, c. Once these values have been found the monthly GDP within a quarter can be calculated.

Inflation Calculation

Inflation variable is created using monthly consumer price index (CPI) from IMF.

$$inflation = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \quad \text{(A.7)}$$

14.2 Appendix B

Our data can also be found [Online] Available:

https://drive.google.com/folderview?id=0B68UQIzPKt1uVVh6RUw2Yktubmc&usp=sharing

15. Tables

1995-2001	Coefficients	F-value	T-value	P-value	R^2
Second regression					
Net export, Model	81, 4 (obs,df)	0.35			0.018
GDP	-0.154		-0.13	0.894	
Diff. share price	0.287		1.07	0.289	
Diff. exchange rate	Omitted				
Interest rate	-0.044		-0.35	0.729	
Inflation	0.145		0.12	0.904	
Constant	44.759		4.81	0.000	

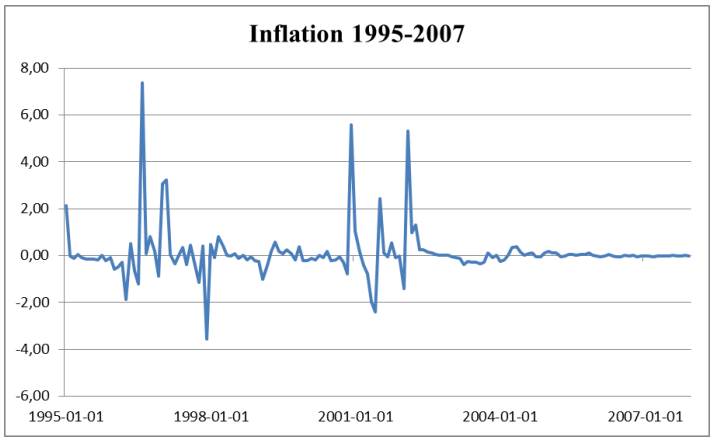
2002-2007	Coefficients	F-value	T-value	P-value	R^2
Second regression					
Net export		2.70		0.03	0.17
Diff. GDP	-0.11		-0.43	0.67	
Share price	-0.06		-0.44	0.67	
Diff. exchange rate	1.43		2.70	0.01	
Interest rate	-0.18		1.17	0.25	
Inflation	-0.31		2.52	0.01	
Constant	55.74		5.20	0.00	

1995-2007, no dummy	Coefficients	F-value	T-value	P-value	R^2
Second regression					
Net export		4.59		0.00	0.13
GDP	-0.028		-0.35	0.73	
Share price	-0.27		-3.24	0.00	
Diff. exchange rate	1.30		1.17	0.24	
Interest rate	-0.29		3.08	0.00	
Inflation	-0.11		-1.35	0.18	
Constant	131.30		10.01	0.00	

1995-2007, with dummy	Coefficients	F-value	T-value	P-value	R^2
Second regression					
Net export		5.89		0.00	0.17
GDP	0.14		1.45	0.15	
Share price	-0.22		-2.65	0.01	
Dummy (floating exchange rate)	27.21		2.88	0.01	
Interest rate	-0.21		-2.25	0.026	
Inflation	-0.06		-0.77	0.44	
Constant	91.65		4.82	0.00	

16. Graphs

H1



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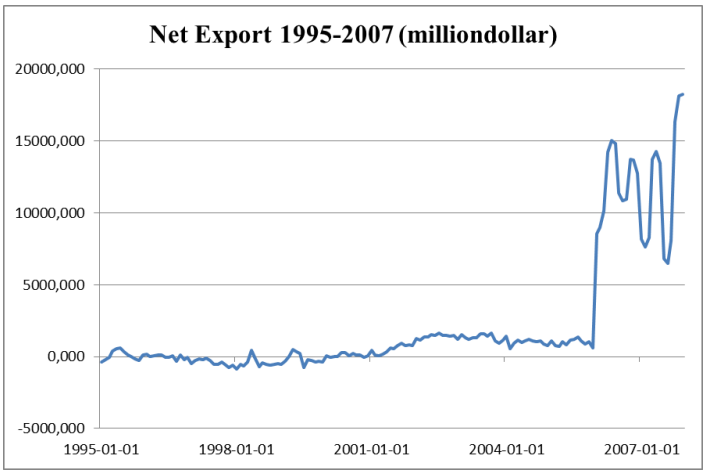

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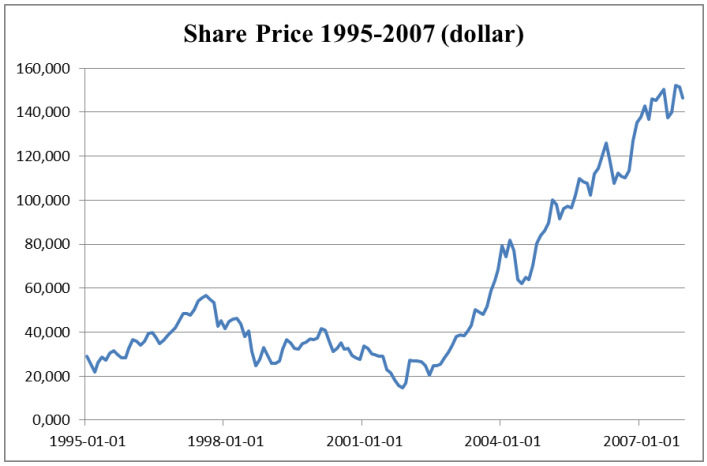

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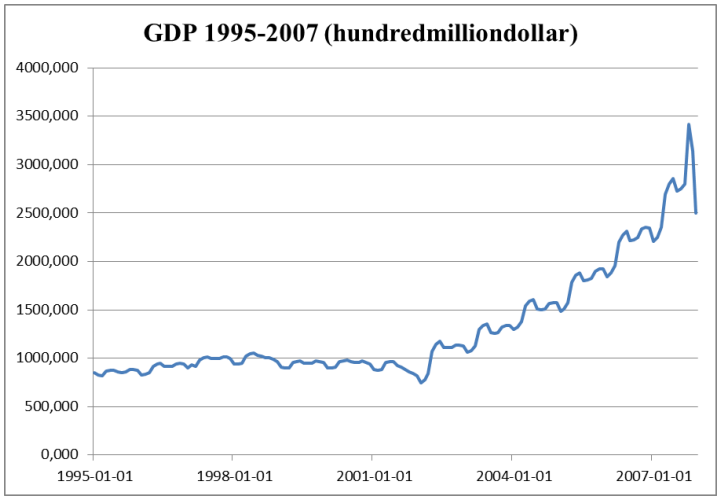
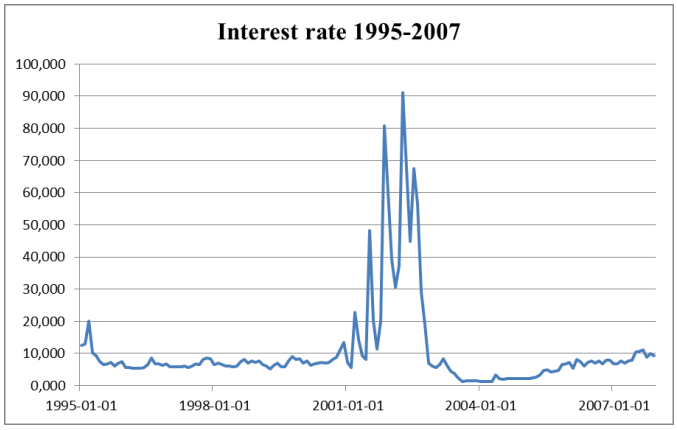


H5



H6